CLAIMS

1. Process for the gas-phase polymerization of α-olefins CH_2=CHR, where R is hydrogen or a hydrocarbon radical having 1-12 carbon atoms, carried out in a first and in a second interconnected polymerization zones, to which one or more of said α-olefins are fed in the presence of a catalyst under reaction conditions and from which the polymer product is discharged, wherein the growing polymer particles flow through the first of said polymerization zones under fast fluidization conditions, leave said first polymerization zone and enter the second of said polymerization zones through which they flow in a densified form under the action of gravity, leave said second polymerization zone and are reintroduced into said first polymerization zone, thus establishing a circulation of polymer between the two polymerization zones.

2. Process according to Claim 1, wherein said fast fluidization conditions are established by feeding a gaseous mixture comprising one or more of said α-olefins CH_2=CHR to said first polymerization zone.

3. Process according to Claim 2, wherein said gaseous mixture is fed to said first polymerization zone in a region below the point of reintroduction of the polymer into said first polymerization zone.

4. Process according to Claim 3, wherein the feeding of said gaseous mixture is carried out by means of gas distributor means.

5. Process according to Claim 2, wherein the polymer and the gaseous mixture leaving said first polymerization zone are conveyed to a solid/gas separation zone and the polymer leaving said solid/gas separation zone enters said second polymerization zone.

6. Process according to Claim 1, wherein the control of the polymer circulating between the said two polymerization zones is effected by metering the quantity of polymer leaving said second polymerization zone.

7. Process according to Claim 1, wherein the polymer produced is withdrawn continuously from said second polymerization zone.

8. Process according to Claim 1, wherein the catalyst components are fed to said first polymerization zone.

9. Process according to Claim 1, wherein any of the reaction zones is fed with a catalyst in a prepolymerized form.

10. Process according to Claim 1, wherein any of the reaction zones is fed with a catalyst dispersed in a polymer slurry.

11. Process according to Claim 1, wherein any of the

reaction zones is fed with a catalyst dispersed in a dry polymer.

12. Process according to Claim 5, wherein the gaseous mixture leaving said solid/gas separation is compressed, cooled and transferred, if appropriate with addition of make-up monomers, to said first polymerization zone.

13. Process according to Claim 5, wherein part of the gaseous mixture leaving the solid/gas separation zone is used for transferring the polymer from said second zone to said first polymerization zone.

14. Process according to Claim 5, wherein part of the gaseous mixture leaving said solid/gas separation zone is compressed and transferred to said second polymerization zone in the vicinity of the region where the polymer leaves said second zone.

15. Process according to Claim 12, wherein the gaseous mixture leaving said solid/gas separation zone is cooled to temperatures below the dew point.

16. Process according to Claim 1, wherein said first polymerization zone is cooled by external cooling means.

17. Process according to Claim 1, wherein the make-up monomer or monomers are fed in an at least partially condensed form to said first polymerization zone.

18. Process according to Claim 2, wherein the velocity of the fluidizing gas into said first polymerization zone is between 2 and 15 m/s, preferably between 3 and 8 m/s.

19. Process according to Claim 1, wherein the polymer is in the form of spheroidal particles having mean dimensions of between 0.2 and 5 mm, preferably between 0.5 and 3 mm.

20. Process according to Claim 1, wherein the working pressure is between 0.5 and 10 MPa, preferably between 1.5 and 6 MPa.

21. Process according to Claim 1, wherein one or more inert gases are present in said polymerization zones at partial pressures of between 5 and 80% of the total pressure of the gases.

22. Process according to Claim 21, wherein the inert gas is nitrogen or an aliphatic hydrocarbon having 2-6 carbon atoms, preferably propane.

23. Process according to Claim 1, wherein an intermediate polymerization zone, operating with a fluid bed, is interposed between said first and said second polymerization zones.

24. Apparatus for the gas-phase polymerization of α-olefins, comprising: a first vertical cylindrical reactor (20) equipped with a catalyst feedline (34);

and a second vertical cylindrical reactor (30) equipped with a polymer discharge system (23); the upper region of said first reactor (20) being connected by a first line (21) to a solid/gas separator (22) which is in turn connected to the upper region of said second reactor (30); the lower region of said second reactor (30) being connected by a second line (31) to the lower region of said first reactor (20); and said solid/gas separator (22) being connected by means of a recirculation line for the gaseous mixture (36) to said first reactor (20) in a region (37) at the bottom of said first reactor (20) below the point of entry of said second line (31).

25. Apparatus according to Claim 24, wherein said first reactor (20) is equipped with gas distributor means (33) located between the point of entry of said second line (31) and said region (37) at the bottom of said first reactor (20).

26. Apparatus according to Claim 24, wherein a first control valve (24) for controlling the polymer flow rate is interposed between said second reactor (30) and said second line (31).

27. Apparatus according to Claim 26, wherein said first valve (24) is a mechanical valve.

28. Apparatus according to Claim 26, wherein said first

valve (24) is a non-mechanical valve.

29. Apparatus according to Claim 25, wherein said catalyst feedline (34) is connected via a third line (32) to said first reactor (20) at a point above said gas distributor means (33).

30. Apparatus according to Claim 24, wherein said recirculation line for the gaseous mixture (36) is equipped with a compressor (26), a cooling system (27) and systems for introducing monomers (28) and molecular weight regulator (29).

31. Apparatus according to Claim 24, wherein said first line (21) leaves the upper region of said first reactor (20) laterally.

32. Apparatus according to Claim 24, wherein the upper region of said first reactor is of frustoconical geometry with the broad end uppermost.

33. Apparatus according to Claim 30, wherein said recirculation line for the gaseous mixture (36) is connected, at a point downstream of said compressor (26), via a line (25) to said second line (31).

34. Apparatus according to Claim 24, wherein said first reactor (20) is equipped with external cooling means (35).